Description

Filter and blower unit for breathing masks or bonnets

This invention relates to a filter and blower unit for breathing masks or bonnets with a breathing air filter that is driven by a direct current motor and designed for use in potentially explosive areas.

Breathing masks or bonnets supplied with air via a breathing air filter are commonly equipped with a filter and blower unit driven by a direct current motor to increase breathing comfort, that is, to make breathing through the filter material easier and facilitate long-term assignments of the wearer as well as the use of specific filter types.

Filter and blower units are often required to be designed for use in potentially explosive areas. This entails the requirement to design the direct current motor that drives the filter and blower unit in such a way that any sparks that may occur during its operation cannot ignite the potentially explosive atmosphere. Motors of filter and blower units that are no longer considered intrinsically safe due to their high rating and cannot be operated in potentially explosive atmospheres must therefore meet the requirements of the "d" type of protection - i.e. have an explosion-proof enclosure. An explosion-proof enclosure, however, is a disadvantage for filter and blower units as the manufacturing effort for motors of that design is very high due to the required narrow widths of gap and great gap lengths between the motor enclosure opening and the motor shaft, which makes such motors expensive. Blower motors designed according

to the "d" type of protection are also quite heavy because of the measures required to neutralize the ignition power that can occur inside the motor enclosure. In addition, they cannot be used in the "0" zone.

Motors not designed according to the "d" type of protection can only be operated in an explosive atmosphere if power input including inductivity are not too high, i.e. still in the intrinsically safe range ("i" type of protection). The high-performance direct current motors used for filter and blower units do not meet this requirement.

It is the problem of the invention to develop a filter and blower for a filter and blower unit to be used in zone "0" potentially explosive atmospheres that is intrinsically safe, can be operated at high performance, and manufactured at comparatively low cost.

This problem is solved according to the invention by the filter and blower comprising the characteristics described in claim 1. The dependent claims disclose further characteristics and advantageous improvements of the invention.

The inventive idea starts from an external rotor motor with an internal stator and fixed coils (stator coil module) and fixed electric terminals for the coils as well as a magnetic rotor arranged pivotably on the perimeter of the stator to create a magnetic field, and consists in embedding the electric connecting lines and coil terminals as well as the upstream motor control and voltage converter modules of the motor in a non-conductive casting compound while supplying power at a voltage that is still in the intrinsically safe range and

an accordingly higher current for the required motor rating.

A filter and blower unit designed in this way is intrinsically safe as regards power supply, power input, and motor operation despite the fact that its high output is above the criteria of intrinsic safety; it is of simple design and can be manufactured easily and at low cost, it is more lightweight than filter and blower units designed according to the "d" type of protection and can be used in a zone "0" potentially explosive atmosphere that has the highest safety requirements.

An embodiment of the invention is explained in greater detail below with reference to the figures. Wherein:

Fig. 1 shows a lateral view of a filter and blower unit with power supply, a partially sectional view and exploded diagrammatic view, and

Fig. 2 shows a top view of the stator and the power supply of the direct current motor for the filter and blower unit.

The filter and blower unit is designed as an external rotor motor in which the armature is a fixed stator coil module 1 that is fixedly mounted on a stator circuit board 2. The stator coil module 1 includes coil cores 4 with a coil 5 wound onto each of them that are arranged concentrically around a bearing shell 3. The components, electric leads and terminals of the stator coil module 1 and the stator circuit board 2 are embedded in a non-conductive casting compound 6. Via electric connecting lines 7, the stator circuit board 2 is connected to a motor control module 8 and a voltage converter module 9 whose circuit boards 8a, 9a are also embedded in a

casting compound. The stator coil module 1 and the motor control and voltage converter modules 8, 9 are mounted on a base circuit board 10 on which the connecting lines 7 are also embedded in a non-conductive casting compound. The stator coil module 1 is encompassed on its periphery by a magnetic rotor 12 in a pot-type case 11 to generate a magnetic field, said rotor being rotatably mounted around the stator coil module 1 using a shaft 13 centered in the pot-type case 11 and supported by the bearing shell 3. Blades 14 are attached to the outer perimeter of the pot-type case 11 that can be rotated around the stator coil module 1.

As the blower motor (direct current motor) used is an external rotor motor in which both the coils 5 and their connections to the voltage source 15 are fixed and embedded in a casting compound 6, electric output emerging during operation cannot get outside, which means that the direct current motor is intrinsically safe even without the otherwise required explosion-proof enclosure according to the "d" type of protection. A voltage converter module 9 that provides a high motor output in excess of the limits of intrinsic safety is located upstream of the motor control module 8 for power supply and direction of rotation identification and is also shielded by a casting compound, making this portion of power supply intrinsically safe as well. Power is supplied to the voltage converter module 9 at a still intrinsically safe current to voltage ratio, i.e. at a voltage of, for example, 6 to 8 V that still meets the requirements of intrinsic safety, running openly from an intrinsically safe accumulator or battery pack 15, and a higher current that corresponds to the required motor output.

In the embodiment described above, the motor of the filter and blower unit is considered intrinsically safe in all its parts - from power input to operation - and can be used in potentially explosive areas such as zone "0" potentially explosive atmospheres where there is a lasting or frequent explosion hazard. In addition, the blower unit is of a simple design and lightweight.